

# Kaiy Muhammad

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## EDUCATION

### Rochester Institute of Technology

*Bachelor of Science in Computer Science, GPA 3.7*

August 2020 – Expected December 2024

*Rochester, NY*

## RESEARCH

### Summer Research Program

May 2024 - August 2024

*MIT Lincoln Laboratory – Robotics Research*

*Boston, MA*

- 3D Reconstruction (NeRF, Gaussian Splatting) and semantic navigation research for legged robots in collaboration with Stanford Mac Swager's Multi-Robot Systems Lab

### Undergraduate Thesis | *Python, Pytorch, ROS, OpenCV*

January 2024 - December 2024

*Generalized Odometry Research Tool for Mobile Robotics*

*Rochester, NY*

### ML Research Assistant | *Python*

December 2022 – May 2023

*RIT Autonomy, Warfare, and Engineering Lab*

*Rochester, NY*

- Led implementation of multi armed bandit ML models for application in autonomous connected vehicles
- Presented research poster at Computing Sciences in Colleges Northeastern Conference (CCSCNE) 2023

## INDUSTRY EXPERIENCE

### Robotic Flight Software/VnV Intern | *Bash, Python, Hardware*

September 2023 – December 2023

*NASA Jet Propulsion Laboratory - Autonomous Lunar Rovers*

*Pasadena, CA*

- Finalized lunar rovers for 2024 Cooperative Autonomous Distributed Robotic Exploration (CADRE) mission
- Participated in thermal vacuum chamber (TVAC) testing
- Developed software and internal tools including a Python script to format parameters for rover initialization and a Bash script for time synchronization
- Troubleshooted rover operations in electronics bench testing and field testing
- Learned F-Prime flight software framework for C++ development

### VIO Navigation Co-op | *C++, Python, ROS2, PyTorch, OpenCV*

January 2023 – August 2023

*KEF Robotics – Unmanned Aerial Vehicles (UAVs)*

*Pittsburgh, PA*

- Implemented Kalman filter for fusing vision based state estimation with barometer and LIDAR data
- Applied PyTorch to eliminate nonuniformities in thermal images through de-noising techniques
- Conducted and integrated tooling for calibration of EO/IR cameras and IMUs (Inertial Measurement Units)
- Carried out field testing and data collection trips with team of drone pilots and researchers
- Alone spearheaded previously nonexistent downward hazard collision avoidance and trajectory recovery behavior
- Tackled sparse and dense optical flow methods by investigating capability for motion tracking in low-contrast thermal environments

### Perception Co-op | *C++, Python, SQL, ROS1/ROS2, OpenCV*

January 2022 – August 2022

*Nauticus Robotics – Autonomous Underwater Vehicles (AUVs)*

*Houston, TX*

- Replaced object detection algorithm with YOLOv5 for a 6% increase in Mean Average Precision (mAP) score
- Trained object detection model using KubeFlow and Git CI/CD pipelines
- Integrated 3D Reconstruction algorithm into ROS for UAV mapping
- Implemented script hashing images into comparable bit string in order to deduplicate perception training data
- Pipelined training of 3D pose estimation system automating hours of work
- Made interactive RVIZ simulation used for DARPA demo to visualize detected objects in robotic knowledge-base
- Proposed and implemented in C++ a reworked underwater orbit behavior used to inspect detected objects.

## TECHNICAL SKILLS

**Languages:** C++, Python, Bash

**Libraries/Frameworks:** ROS/ROS2, OpenCV, GTSAM, PyTorch

**Developer Tools:** Docker, Git, Linux, Gazebo, L<sup>A</sup>T<sub>E</sub>X

**CAD and Hardware:** AutoCad, Arduino, Raspberry Pi, Autodesk Eagle, Autodesk Fusion